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Pod Test for Phomopsis Seed Decay of Soybean

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Phomopsis seed decay, caused by the fungus Phomopsis longicolla is a major problem to soybean seed producers, because of adverse effects on seed germination. Control can be achieved by application of benzimidazole fungicides to the growing seed crop. Very often, the disease is not severe enough to justify application costs. A predictive method, therefore, was developed to identify fields that should be sprayed.

The method uses the amount of pod infection at growth stage R6 as an indicator of the potential level of seed infection at harvest time. Early studies on the epidemiology of this disease showed that pods could become infected by the pathogens from flowering time onwards. Seed infection then could occur after plants reached physiological maturity. Certain criteria had to be met for the pod test predictive method to be epidemiologically feasible. First, the growth stage at which seed infection could occur was determined to be the beginning of R7. It was important to define this precisely, because fungicide applications have to be made before seeds are infected. It also was important to show that fungal inoculum, reaching pods after pod infection was measured, did not cause significant seed infection. Finally, a method was required to to make a quick and accurate measurement of pod infection.

A pod test was developed that utilizes the fact that herbicides, applied to soybean plant tissues, cause Phomopsis spp. to produce characteristic fruiting bodies. The method requires that pods be detached from plants at the R6 growth stage. They are treated with sodium hypochlorite (household bleach) which sterilises surface contaminants, then immersed momentarily in the herbicide Basagran, and incubated in a moisture chamber for 7 days at room temperature. Pods are then examined microscopically for presence of Phomopsis fruiting bodies. Other fungi also grow on the pods, but they are readily distiguished from Phomopsis.

Correlations were established between pod infection and seed infection at harvest maturity. Tolerances were then established as follows:

- If less than 25% of the pods are infected, do not apply a fungicide.
- If 25-50% of the pods are infected and the crop is early maturing or precipitation is forecast for several days during the next week, a fungicide may be necessary.
- If more than 50% of the pods are infected, apply a fungicide.

With the exception of a steroscopic microscope (approximate cost $300), all the materials and equipment for this test can be purchased at a hardware store. A laboratory is not necessary to carry out the test. Also seed company personnel are able to carry out the test with minimal training. The method was introduced in

1984 and is now used extensively by the seed industry throughout the mid-west. Some companies use the test on all production fields, others employ it on "indicator" fields to estimate the amount of pod infection present in a particular production area. Informal surveys of companies that previously sprayed with a fungicide on a regular basis, have indicated the method has resulted in substantial savings in spraying costs, with minimal loss in seed quality.

A disadvantage of the predictive method is that it cannot account for effects of weather after the pod test is made. As discussed earlier, significant amounts of seed infection will not occur, regardless of climatic conditions, until the R7 growth stage. Seed infection then will proceed if certain environmental conditions develop. A recent study in Iowa elucidated the temperature and humidity conditions necessary for the fungus to move from pods to seeds. This information has been used to develop a mathematical model that will improve the predictability of the pod test by incorporation of short-term weather forecasts.